

53. (Twice Amended) A method according to claim 49, wherein the galactose oxidase is in the form of a crude enzyme preparation.

Please add a new claim 54:

54. (New) A composition according to claim 33, wherein the enzyme which is capable of converting a compound into a substrate for the galactose oxidase is an enzyme that converts the compound into a galactan, a galactose oligomer, a galactose dimer, or a mixture of a galactan, a galactose oligomer and a galactose dimer.

REMARKS

I. SOME OF THE EXISTING CLAIMS ARE CANCELED AND REPLACED BY CLAIMS INTRODUCED IN AUGUST 1999 IN THE INTERNATIONAL STAGE

During a personal interview granted to Applicants' counsel, discussed in detail below, it was suggested to Applicants that the existing claims 1-23 should be canceled and a substitute set of claims, corresponding to the new claims introduced in August 1999 in the international stage of the application (including all amendments made therein during prosecution of this application), be submitted to avoid further confusion. Applicants followed that suggestion, canceled the existing claims 1-23 in the application and replaced them with claims 33-53. The replacement claims 33-53 correspond substantially to replaced claims 1-23 as set forth below. Minor amendments were made in claims 40, 43-45 and 53 in addition to claim 33, which has been amended as detailed below in accordance with discussion at the interview.

<u>Cancelled Claims</u>	<u>Replacement Claims</u>
1	33
2	cancelled
3	34
4	35
5	36
6	37
7	38
8	39
9	cancelled (incorporated into claim 33)
10	40
11	41
12	42
13	43
14	44
15	45
16	46
17	47
18	48
19	49
20	50
21	51
22	52
23	53

Applicants added a new claim 54, support therefor being found in the specification as a whole, e.g., pages 8 and 9. Applicants also cancelled the former claims 2 and 9 (the latter claim now being substantially incorporated into claim 33). Applicants request that in all future proceedings, claims 24-54 be examined in the application.

II. PERSONAL INTERVIEW

Applicants express their appreciation to Examiners Michael Miller and David Naff for the courtesy of granting a personal interview to the undersigned counsel on December 19, 2001.

A short summary of the interview appears in the "Interview Summary" issued on December 19. Applicants wish to expand on the summary in accordance with MPEP § 713.04.

A. Rejections of Claims 1-34 (*sic.*, 32) Under 35 U.S.C. § 112, First Paragraph

Applicants argued that the rejection of Claim 1 under this section of the statute is misplaced based on the court decisions of *In re Johnson*, 558 Fed.2d 1008, 1019, 194 U.S.P.Q. 187, 196 (CCPA 1977) and *Ex parte Grasselli*, 231 U.S.P.Q. 393 (Bd. App. 1983), *aff'd mem.*, 738 Fed.2d 453 (Fed. Cir. 1984). The Examiners said that they would consider arguments based on these decisions if Applicants submit them in a response to the Office Action.

Alternatively, the Examiners said that this rejection would be overcome if Applicants incorporate the subject matter of Claim 9 into Claim 1 and delete from Claim 1 the recitation of "other than galactose".

With respect to Claim 34 (*sic.*, 32), Applicants argued that support exists for the disputed recitation ("a compound which is capable of being converted into the substrate for the galactose oxidase") in the specification as a whole, for example, in the original Claim 1. The Examiners asked Applicants to submit appropriate arguments in a response.

B. Rejections of Claims 4, 8-11 and 17-23 Under 35 U.S.C. § 112, Second Paragraph

These rejections were caused by the Examiner reviewing the original claims of the PCT application, rather than the "new claims", filed during the international stage in August of 1999. Applicants pointed out that the "new claims" should have been examined since it was Applicants' understanding that they were communicated by the

International Bureau to the U.S. Patent and Trademark Office ("PTO") and Applicants filed on January 18, 2000 a Request to Examine Application on the Basis of the Text Amended Under Article 34 of PCT, bringing that matter to the PTO's attention.

Nonetheless, the Examiners suggested that the easiest way to fix this problem would be to cancel all the existing claims and insert a replacement set of claims which would include the August 1999 claims.

C. Rejection Under 35 U.S.C. § 102 Over *van der Lugt et al.*

Applicants pointed out that this reference was improperly cited under 35 U.S.C. § 102(b) because it was published less than one year from Applicants' earliest U.S. priority date of July 22, 1997 (based on a U.S. provisional application No. 60/053,451). The Examiners agreed, but said the reference would still be citable under 35 U.S.C. § 102(a). They suggested that if Applicants wanted to remove that reference as prior art, it could be done by swearing behind its publication date of 1997 in a Declaration Under 37 CFR § 1.131 ("Section 131").

Alternatively, the Examiners suggested that the amendment of Claim 1 by incorporating into it Claim 9 would also overcome this rejection, providing that the disclosure in *van der Lugt et. al.* of the use of galactose oxidase in a dough containing stachyose would not anticipate the definition of the substrate compound of Claim 9 (a galactan, a galactose oligomer or a galactose dimer). In this connection, Applicants note that the "Interview Summary" contains a typographical error. The word "not" is missing in the last line of comments after the word "does". Applicants understand this line to read "...rejection providing stachyose does not read on claim 9."

D. Rejections Under 35 U.S.C. § 103

The Examiners pointed to the disclosure in Clark (U.S. Patent 4,458,686) of D-galactose, stachyose and lactose as typical substrates for galactose oxidase. They asked Applicants to establish that this disclosure would not have an adverse effect on patentability of claim 1 amended to include the Markush group of the substrates of claim 9 (or claim 1 in its present form). In particular, they expressed their belief that lactose is a galactose dimer.

If Applicants can establish the lack of such adverse effect by Clark, the Examiners appeared to indicate that evidence of unexpected results present in the application is likely to overcome these rejections. They suggested that Applicants strongly argue such evidence. With respect to that evidence in Example 2, the Examiners asked Applicants to confirm that arabinogalactan treated with arabinofuranosidase to cleave arabinose is the same as galactan.

III. CLAIMS 1-34 (sic, 32) SATISFIED REQUIREMENTS OF 35 U.S.C. § 112, FIRST PARAGRAPH. AMENDED CLAIMS CONTINUE TO SATISFY THAT REQUIREMENT.

Claims 1-32 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter not described in the specification in such a way as to reasonably convey to a person skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention. In particular, it was alleged that Applicants' insertion of "other than galactose" in claim 1 raised the issue of new matter. As discussed during the interview, CCPA and other court decisions provide support for Applicants' assertion that the deletion of one of several species expressly recited in the specification is proper and does not constitute new matter. *See in re Johnson, supra*. Since Applicants described galactose as one of several substrates for galactose

oxidase (e.g., see page 8, lines 16-20) they possessed the subject matter of the invention of claim 1 prior to this Amendment, when their application was filed.

Nonetheless, Applicants amended claim 1 (now claim 33) to incorporate the limitations of claim 9, as also suggested by the Examiners. The amended claim continues to satisfy the requirements of Section 112.

Claim 32 was also rejected under the same section of the statute, because, allegedly, it lacked support for "a compound which is capable of being converted into the substrate for the galactose oxidase". Applicants also respectfully traverse this rejection. In addition to support for this limitation in the originally-filed claim 1, support for this limitation is present in the specification, considered as a whole (e.g., see page 8, line 24 - page 9, line 9).

IV. REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH.

Claims 4, 8-11, 17, and 23 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite for a number of reasons. As agreed with the Examiners during the interview, these rejections occurred because the Examiner apparently was reviewing original claims filed in the international stage of the PCT application on June 4, 1996, rather than the new claims filed in August 1999. Applicants' cancellation of claims 1-23, and the introduction of the replacement claims 33-53, overcomes that rejection. For the Examiner's convenience, the replacement claims which have been amended relative to the replaced claims present in the application prior to this Amendment are shown as marked-up in Appendix A, but the replacement claims which were not amended are not shown in Appendix A. The amended replacement claims are claims 33, 40, 43-45 and 53, corresponding to replaced claims 1, 10, 13-15 and 23.

V. CLAIMS REJECTED UNDER 35 U.S.C. § 102(b) OVER van der LUGT ET AL. ARE PATENTABLE IN VIEW OF THE DECLARATION UNDER 37 C.F.R. § 1.131 FILED HEREWITH.

Claims 1, 4, 8, 13-16, 19, 21 and 23 (now 33, 35, 39, 43-46, 49, 51 and 53, respectively) were rejected as anticipated by van der Lugt et al., "Application of Oxidoreductases in Baking: Impact on Gluten Structure and Dough Rheology," Eur. Symp. Enzymes Grain Process., proc. 1st (1997), Meeting Date 1996 in The Netherlands (van der Lugt). This rejection is overcome, at least because the enclosed Declaration Under 37 C.F.R. § 1.131 (unexecuted) establishes that Applicants made their invention in a WTO country prior to the effective date of the reference. In this respect, Applicants wish to point out that the effective date of the reference is 1997, its publication date, rather than the December 2-4, 1996 meeting date in The Netherlands. Applicants are enclosing an unexecuted version of the Declaration to expedite prosecution of the application. Applicants will provide an executed version of the Declaration once their Counsel receives it.

VI. CLAIMS 1-32 (NOW 33-53) AND 24-32 ARE PATENTABLE IN VIEW OF SOMERS, WO, BANKS AND CLARK AT LEAST BECAUSE THE COMBINATION OF THE REFERENCES IS ERRONEOUS AS A MATTER OF LAW. EVEN THE IMPROPER COMBINATION WOULD NOT HAVE RENDERED APPLICANTS' CLAIMS OBVIOUS.

Claims 33-53 were rejected as unpatentable over Somers et al., Cereal Food World, July 1996, volume 41, number 7 ("Somers") or van der Lugt, in view of WO 96/39851 ("WO"), Banks et al., U.S. Patent 4,828,853 ("Banks") and Clark, Jr., U.S. Patent 4,458,686 ("Clark"). It was alleged that Applicants had misstated the teachings of Clark in the previous Amendment, insofar as Clark teaches the equivalency of galactose and lactose as substrates for galactose oxidase. In response to Applicants' arguments that the references were not properly combinable, it was stated that the

references cited by the Examiner established knowledge in the art. For example, it was stated, that WO shows the addition of hemicellulases, cellulase, etc., that can be added to dough to improve its properties.


Applicants' reliance on unexpected results shown in the Application was rejected, because, allegedly, they are irrelevant to the art cited by the Examiner in the rejection since Applicants did not show directly unexpected results compared to the art of record. Office Action, pages 4-5.

Applicants respectfully disagree with allegations in the Office Action, and respectfully request reconsideration of this rejection in view of the removal of the van der Lugt reference as prior art, and the following remarks.

Initially, Applicants reiterate their assertion that the combination of the remaining references, WO, Somers, Banks, and Clark is erroneous as a matter of law. Applicants' argument supporting that assertion was set forth in detail in the Amendment Under 37 C.F.R. § 1.111 filed on May 31, 2001, incorporated herein by reference. In particular, Applicants were not provided with any factual basis for the assertion that the teachings of the various references should be combined to modify Somers' teachings with selectively-isolated portions of the disclosures of WO, Banks and Clark. It is well-settled that the PTO has the burden to establish, based on prior art, a motivation to combine the references. This has not been done in the Office Action. Instead, it was simply stated that the references cited in the Office Action established what is known in the art. While Applicants agree that the references, individually, establish the knowledge in the art of various aspects of similar technology, such knowledge alone is not sufficient to provide motivation to combine the references and modify them as was done in the

Office Action of January 31, 2001 ("First Office Action") (apparently included implicitly in the August 9, 2001, Office Action ("Second Office Action")).

Applicants wish to briefly discuss the references relied upon in the rejection. Somers teaches the use of galactose oxidase in the presence of galactose in a dough, and states that the use of galactose oxidase in the presence of galactose provides less pronounced results than that of glucose oxidase. Applicants agree that WO teaches a method of improving the rheological properties of a flour dough by adding an oxidoreductase capable of oxidizing maltose, such as hexose oxidase, and, in one embodiment, at least one additional enzyme, such as a cellulase, a hemicellulase, a xylanase, a glucose oxidase, a lipase and a protease. (WO, page 16)

Banks teaches the presence of a large number (at least 16) of sugars, in baked products. Two of such sugars are lactose or galactose. Clark teaches that ~~di-~~ galactose, stachyose or lactose can be used as substrates for galactose oxidase (see table at columns 7-8). 

Nonetheless, any possible, albeit improper combination of Somers, WO, Banks and Clark would not have suggested to a person of ordinary skill in the art Applicants' invention of claim 33, and claims dependent therefrom. Such an improper combination would have comprised a composition containing galactose oxidase, and dough which contains galactose, hexose oxidase, specifically taught in WO, as well as several other enzymes taught in WO, sugars, such as lactose or galactose. Such an improper, and artificially-created composition would not have suggested to a person of ordinary skill in the art the composition now recited in claim 33, i.e., a composition comprising a galactose oxidase (as a first component) and (as a second component) at least one of

an oxidizable substrate for the galactose oxidase (including a galactan, a galactose oligomer or a galactose dimer), and an enzyme which is capable of converting a compound into a substrate for the galactose oxidase. Of course, claim 33 also includes the combination of oxidizable substrates for the galactose oxidase, as recited therein which would not have been suggested by the artificially-created composition.

None of the references, nor the improper and artificially-made combination of the references, suggests Applicants' claimed composition. For example, the references do not suggest the claimed oxidizable substrate for the galactose oxidase, including a galactan, a galactose oligomer or a galactose dimer. In this connection, Somers' galactose and D-galactose of Clark are monomeric galactoses which would not have rendered obvious Applicants' claimed invention.

Furthermore, in response to the Examiner's inquiry during the interview, Applicants wish to point out that lactose is a dimer of D-glucose and D-galactose (see the attached page 843 of the Merck Index (1989) teaching that hydrolysis of lactose with acid produces one mole of D-glucose and one mole of D-galactose).

With respect to stachyose, it appears to include two molecules of galactose (see the attached page from Plant Biology Index and page 678 from Merck Index). However, it is not a galactose dimer nor a galactose oligomer since it includes at least one additional molecule of sugar. In contrast, as is known to those skilled in the art, the terms "galactose dimer" or "galactose oligomer" refer to sugars containing only galactose units.

Even if, *arguendo*, the improper combination of references did establish a *prima facie* case of obviousness, Applicants respectfully submit it would be effectively rebutted

by evidence of unexpected results included in the application (as discussed at the interview). As shown in the specification, Applicants tested monomeric galactose as a substrate for galactose oxidase in comparison with di-galactose and arabinogalactan treated with arabinofuranosidase (which is believed to include a poly-galactose or oligomer of galactose (Example 2 and Fig. 4)). Applicants wish to confirm that an arabinogalactan treated with arabinofuranosidase to cleave arabinose is indeed galactan. As shown in the specification, it was surprisingly discovered by Applicants that galactan was approximately three times more effective as a substrate for galactose oxidase than galactose (i.e., monomeric galactose), and di-galactose was almost as good as galactan. This evidence of unexpected results provides strong support for Applicants' arguments that the art of record, taken alone or in any possible combination, fails to establish a *prima facie* case of obviousness of Applicants' claimed invention. The effect of galactose oxidase in reducing the undesirable side effects on the dough quality by the addition of hemicellulases was completely unknown in the art at the time that Applicants made their invention. This is established by a lack of any suggestion in the art to use galactose oxidase in the context of Applicants' claimed invention, and further underscored by the unexpected results which establish the inferiority of the use of monomeric galactose (disclosed in the prior art of record) as a substrate for galactose oxidase, as compared to di-galactose and galactan.

For all of the above reasons, withdrawal of this rejection is solicited.

VII. CLAIMS 24-53 ARE PATENTABLE OVER SOMERS IN VIEW OF '94, BANKS, CLARK, GILLMORE AND YOKOTSUKA BECAUSE THE COMBINATION OF THE REFERENCES IS IMPROPER. EVEN THE IMPROPER COMBINATION WOULD NOT HAVE RENDERED THE CLAIMS OBVIOUS. EVIDENCE OF UNEXPECTED RESULTS REBUTS ANY POSSIBLE *PRIMA FACIE* OBVIOUSNESS.

Claims 1-34 (now 24-53) were rejected under 35 U.S.C. 103(a) as unpatentable over Somers or van der Lugt in view of WO 94/28728 ("94"), Banks, Clark, Gillmore et al., U.S. patent 5,063,072 and Yokotsuka et al., U.S. patent 4,820,520, for reasons of record (presumably in the First Office Action) and for additional reasons stated in the Second Office Action. Those additional reasons include an allegation that Applicant had not provided any arguments except to state that the references were not properly combinable. It was also repeated that the references cited by the Examiner established knowledge in the art and Applicants had not provided any convincing arguments to address why the references were improperly combinable. We alleged that the case of *prima facie* obviousness was satisfied because the references established that, at the time that the invention was made, the invention was obvious. Second Office Action, page 5.

Applicants respectfully and strongly traverse this rejection.

Since van der Lugt has been removed as a prior art reference, it will not be discussed herein.

Somers, Banks and Clark were discussed above. The disclosure of '94 was relied upon for its teaching of the addition of a laccase to a dough and bread products to improve their properties. It was also relied upon for its teachings that other enzymes may be used with laccase, such as cellulases, hemicellulases, pentosanases, glucose oxidase, lipase, protease and alpha-amylase. First Office Action, page 5.

Gillmore was cited for its apparent teaching that the alimentary paste and dough are the same and Yokotsuka for its disclosure that noodle dough is routinely used in dough making. First Office Action, page 6.

It was concluded that it would have been obvious to add hemicellulases in the composition of Somers since both Somers and '94 teach that the enzymes are used as dough improving agents and all enzymes are expected to improve dough. First Office Action, page 6. It was also stated that the use of noodle or alimentary dough would have been obvious in view of the teachings of Gillmore and Yokotsuka, and it would have been obvious to use lactose instead of galactose as a substrate for galactose oxidase in view of the teachings of Banks and Clark. First Office Action, page 6. It was additionally concluded that Clark's disclosure would have made it obvious to derive the galactose oxidase from a microorganism, such as a plant, fungi or bacteria. It was further asserted that it is well known in the art that microorganisms-derived enzymes have beneficial properties as compared to non- microorganisms derived enzymes. First Office Action, pages 6-7.

Applicants reiterate that while the references disclose what was known in prior art, Applicants were not presented with any reasons, based on this prior art, to indicate the motivation to combine selectively-isolated portions of teachings of prior art from the references with other selectively-isolated teachings to allegedly arrive at Applicants' claimed invention. Such a selective picking and choosing of various portions of the six references could only have been made with the improper hindsight provided by Applicants' own disclosure.

Even the improper combination would have failed to suggest to persons skilled in the art Applicants' invention (now recited in claims 24-53 and the new claim 54). For example, such an improper combination would have comprised flour dough, including

(monomeric) galactose and the enzyme, galactose oxidase, stachyose and lactose and the use of such dough to make bread or noodles.

Such a combination would have failed to suggest Applicants' claimed composition, now recited in claim 33. The claimed composition includes, as the first component, a galactose oxidase and as a second component, an oxidizable substrate for the galactose oxidase which comprises at least one of a galactan, a galactose oligomer or a galactose dimer, and further comprises an enzyme which is capable of converting a compound into a substrate for the galactose oxidase. There is simply no disclosure in any of the individual six references or in the improperly created combination disclosure which would have suggested to a skilled person the claimed composition.

Any possible case of *prima facie* obviousness would have been rebutted by the evidence of unexpected results, discussed above, which compares the use of galactose oxidase on galactan and galactose dimer to that on galactose. As discussed above, galactose under-performed the other two substrates (included in Applicants' invention) approximately by a factor of three.

VIII. REQUEST FOR ALLOWANCE

In view of the Declaration Under 37 C.F.R. § 1.131, and arguments set forth above, an indication of allowance of all claims is solicited.

In the event that any outstanding issues remain, or the Examiner has any questions or suggestions for placing the application in condition for allowance, Applicants would appreciate the courtesy of a telephone call to the undersigned Counsel to resolve such issues and place the application in condition for allowance.

Respectfully submitted,

HUNTON & WILLIAMS

Dated: January 28, 2002

By: 

Stanislaus Aksman
Registration No. 28,562

1900 K Street, NW, Suite 1200
Washington, DC 20006
(202) 955-1926—Telephone
(202) 778-2201—Facsimile

APPENDIX A

24. (Once Amended) A composition according to claim [1] 33, wherein the oxidizable substrate for the galactose oxidase comprises at least one of: a compound naturally present in cereal flour, lactose or a hydrolysis product of arabinogalactan.

28. (Once Amended) A composition according to claim [1] 33, wherein the compound convertible into a substrate for the galactose oxidase includes at least one of a compound naturally present in cereal flour or a gum.

32. (Once Amended) A composition according to claim [1] 33 which further comprises, in the second component, a compound which is capable of being converted into the substrate for the galactose oxidase.

[1.] 33. (Twice Amended) A composition comprising, as a first component, a galactose oxidase (EC 1.1.3.9) and, as a second component[,], (i) an oxidizable substrate for the galactose oxidase which is at least one of a galactan, [other than] a galactose oligomer or a galactose dimer, (ii) an oxidizable substrate for the galactose oxidase including at least one of a galactan, a galactose oligomer or a galactose dimer, and[/] an enzyme which is capable of converting a compound into a substrate for the galactose oxidase, or (iii) an enzyme which is capable of converting a compound into a substrate for the galactose oxidase.

[10.] 40. (Once Amended) A composition according to claim [9] wherein the oxidizable substrate compound is] 39 further comprising lactose, galactose or a combination of lactose and galactose.

[13.] 43. (Twice Amended) A composition according to any of claims [1, 2, 4-12 or 14] 33 or 35-42 further comprising a non-enzymic dough additive compound.

[14.] 44. (Once Amended) A composition according to claim [1] 33 wherein the amount of galactose oxidase is in the range of 1 to 10,000 units [pr] per g.

[15.] 45. (Twice Amended) A method of preparing a flour dough comprising adding to the dough an amount of the composition of any of claims [1, 2, 4-12 or 14] 33, 35-42 or 44 which is sufficient to obtain an amount of galactose oxidase activity in the dough which is in the range of 1 to 10,000 units per kg of flour.

[23. Use] 53. (Twice Amended) A method according to claim [19] 49, wherein the galactose oxidase is in the form of a crude enzyme preparation.